21718

3 Hours / 100 Marks Seat No. | | | | | | | | |

Instructions : (1) All Questions are *compulsory.*

(2) Illustrate your answers with neat sketches wherever necessary.

(3) Figures to the right indicate full marks.

(4) Assume suitable data, if necessary.

Marks

1. (A) Attempt any THREE : **12**

(a) What is analytical Instrument ? Explain basic units of analytical instrument with neat block diagram.

(b) Describe working principle of a time-of-flight mass spectrometer with neat schematic.

(c) Draw schematic of blood pCO_2 electrode & explain its working principle in brief.

(d) Describe the method of measurement of nitrogen oxide using chemi-luminescence phenomenon.

(B) Attempt any ONE : **6**

(a) What is chromatography ? Define following terms with respect to chromatography column.

(i) Retention time (T_R) (ii) Dead Time (t_m) (iii) Capacity factor (k) (iv) Distribution Constant (K_D).

(b) Draw block diagram of gas chromatograph. Explain basic parts of gas chromatograph in detail.

2. Attempt any FOUR : **16**

(a) Explain the interaction of radiation with matter.

(b) What is liquid chromatography ? Describe the technique.

(c) Define the terms ppm, pphm. What does it represent ? Give expression for conversion from volumetric to gravimetric concentration of gas.

(d) What is NMR spectroscopy technique ?

(e) Describe the method of measurement of CO using gas chromatography.

(f) What is thermal conductivity of gas ? What is its significance in quantitative analysis of gas mixture ? Draw schematic diagram of thermal conductivity analyzer using thermistor.

3. Attempt any FOUR : **16**

(a) How spectro-photometer are more efficient than filter photometer ? Draw schematic diagram of spectro-photometer using diffraction grating.

(b) Draw block diagram of NMR spectrometer. Describe peculiarities of magnetic field or system involved in NMR spectrometer.

(c) Define pH. Explain how pH of pure water is equal to 7.

(d) Classify chromatography. What is significance of column length in chromatogram ?

(e) How SO_2 in air is measured using conductivity method ?

4. (A) Attempt any THREE : **12**

(a) List various types of carrier gases used in GC. What is impact of purity of these gases on column performance ?

(b) Draw a neat labelled diagram of a complete blood gas analyzer.

(c) Describe working of IR gas analyser with neat schematic.

(d) What is mass spectrum ? Explain principle of operation of mass spectrometer.

(B) Attempt any ONE : **6**

(a) How ozone measurement is done using oxidizing properties of ozone ?

(b) Draw block diagram of flame photometer. Describe constructional details of flame photometer.

5. Attempt any FOUR : **16**

(a) Explain multi-channel photometer with neat labelled diagram.

(b) Explain phenomenon of electrophoresis. Which factors affects electrophoretic mobility ? Explain with mathematical equation.

(c) List & explain various gas pollutants. State their typical concentration.

(d) Describe constructional details of blood pO_2 electrode.

(e) Explain the method to measure nitric oxide using CO Laser.

(f) Describe calomel electrode with neat diagram.

6. Attempt any FOUR : **16**

(a) Draw labelled schematic diagram of magnetic deflection mass spectrometer. Explain its operation in brief.

(b) How optical density is measured by using double beam densitometer ?

(c) State the Beer-Lambert Law. Express it. Explain the term 'Absorptivity' with expression.

(d) What is resonance condition ? Explain NMR absorption spectra.

(e) Describe constructional details of glass electrode.
